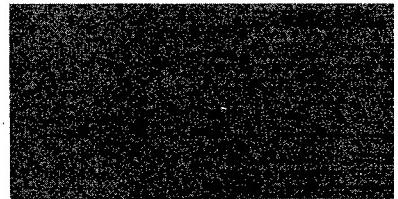
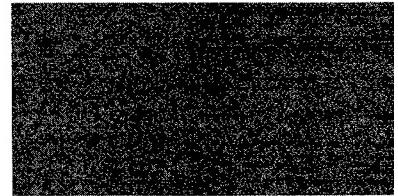


JPRS 70581

1 February 1978



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USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS

GEOPHYSICS, ASTRONOMY AND SPACE

No. 414

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GEOPHYSICS, ASTRONOMY AND SPACE

No. 414

This serial publication contains abstracts of articles and news items from USSR and Eastern Europe scientific and technical journals on the specific subjects reflected in the table of contents.

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I. ASTRONOMY

Abstracts of Scientific Articles

MONITORING OF MARTIAN DUST STORMS

Moscow PIS'MA V ASTRONOMICHESKIY ZHURNAL in Russian Vol 3, No 11, 1977
pp 515-517

[Article by D. F. Lupishko and T. A. Lupishko, Astronomical Observatory, Khar'kov State University, "Possibility of Monitoring Dust Storms on Mars"]

[Abstract] On the basis of photoelectric measurements of the integral brightness of Mars at the oppositions of 1971, 1973 and 1975 it is demonstrated that the difference in star magnitudes Δm in the ultraviolet and red regions of the spectrum is sensitive to changes in transparency of the Martian atmosphere and during periods of global dust storms increases by $0^m.6$. The authors propose that measurement of the Δm value be used as a simple and reliable method for monitoring the transparency of the Martian atmosphere and the presence of dust storms on Mars. In addition to simplicity and reliability, an advantage of this method in comparison with the photographic photometry method (which was used at the Astronomical Observatory, Khar'kov State University in 1971-1972 and 1973-1974 during the periods of operation of automatic stations of the "Mars" series) is the nondependence of measurements on the turbulent state of the earth's atmosphere. This circumstance makes this method indispensable at the time of aphelion oppositions when the small angular dimensions of Mars do not make it possible to judge the degree of atmospheric transparency on the basis of its contrasts on the disk.

[176]

USE OF SPECKLE INTERFEROMETRY OF SOME BRIGHT STARS

Moscow PIS'MA V ASTRONOMICHESKIY ZHURNAL in Russian Vol 3, No 11, 1977
pp 497-499

[Article by Yu. Yu. Balega and N. A. Tikhonov, Special Astrophysical Observatory, Zelenchukskaya, "Speckle Interferometry of Some Bright Stars Using a Six-Meter Telescope"]

[Abstract] At the beginning of the current year speckle-interferometry observations of a number of stars were carried out in the primary focus of the large azimuthal telescope. The use of a microobjective ensured an equivalent focus of 51.6 m. Filters with a width of 300-500 Å were used in the red region. With exposures from 0.004 to 0.03 sec and use of highly sensitive isopanchromatic aerial films it was possible to obtain images of satisfactory density for stars up to 2^m. The Labeyrie method was used in measuring star diameters and distances in close binary systems. On the basis of the results of speckle-interferometer observations the angular diameter of Betelgeuse is 0''.053. The angular distance and the position angle, determined for the classical binary Capella, agree well with the theoretical orbit.

[176]

PHOTOMETRY OF TELEVISION PHOTOGRAPHS OF METEORS

Moscow ASTRONOMICHESKIY VESTNIK in Russian Vol 11, No 4, 1977 pp 230-235

[Article by M. Begkhanov and S. Mukhamednazarov, Physical-Technical Institute Academy of Sciences Turkmen SSR, "Photometry of Television Photographs of Meteors"]

[Abstract] A study was made of the method of photometry of television photographs of meteors on the basis of measurement of the cross-sectional diameter of a meteor trail on a negative. Studies were made of the losses of brightness of the object due to its velocity of movement over the photocathode of the image converter. The results of studies of the brightness curves of faint meteors indicated that they differ from the brightness curves of bright meteors. It was discovered that in obturator photographs of faint meteors obtained using the television system there is an intensive glow of the meteor trail in the gaps formed by the obturator blades.

[182]

MOVEMENTS AND MAGNETIC FIELDS ON SUN

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY, RADIOFIZIKA in Russian Vol 20, No 9, 1977 pp 1302-1309

[Article by V. A. Krat, Main Geophysical Observatory, "Movements and Magnetic Fields on the Sun"]

[Abstract] The measured magnetic fields, in general, cannot be regarded as the "mean" values of magnetic field strength H due to depolarization effects in the sum of Zeeman components of small elements. The pattern of very small magnetic elements in the photosphere can be identified with the photospheric

granulation net. The relatively great lifetime of the elements in this net and the characteristics of its evolution show that a magnetic field $H \gtrsim 10^2$ oe is concentrated in the dark grid between the granules near the center of the solar disk. Direct measurements H in solar prominences give H_{\parallel} values in the range from 10 to 10^2 oe. On the boundary they cannot be less than 10^2 oe. The chromospheric elements visible at the center of the H line (the spectrograms were obtained using the Solar Stratospheric Observatory (SSO) in 1970-1973) are four times broader than the photospheric elements. The increase in size of the structural elements from the photosphere to the chromosphere is associated with the magnetic broadening of the elements "floating up" in the atmosphere. On the basis of stratospheric observations and observations using high-quality filters it is shown that magnetic arcs are typical field configurations. Sunspots are represented as stationary processes dissipating due to magnetohydrodynamic instabilities. They have (according to SSO observational data) considerable sectors with a uniform magnetic field in the spot umbra. The complex system of twisted magnetic "plaits" in the outer part of the umbra and penumbra of the spot is associated with dissipation of the main configuration. The most likely model of a sunspot is a twisted toroid with a magnetic field directed along the axis of symmetry within the toroid. This model makes it possible to explain the fact of existence of a group of secondary sunspots within the principal group. The axis of such a toroid always remains within the photosphere. Some properties of supergranules and giant granules are discussed.

[188]

II. METEOROLOGY

Abstracts of Scientific Articles

MAIN WAVES CREATED BY A TROPICAL HURRICANE

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 11, 1977 pp 1118-1131

[Article by V. V. Shuleykin, Black Sea Division, Marine Hydrophysical Institute, "Computation of the Main Waves Created by a Tropical Hurricane"]

[Abstract] The field of a tropical hurricane is correctly considered to be symmetric relative the axis which participates in the translational motion of the entire system of the hurricane. But it is highly asymmetric relative to a fixed coordinate system related to the surface of the planet. Vector diagrams of the resultant wind velocities made it possible to give a quantitative characterization of this asymmetry. The presence of asymmetry creates to the right of the hurricane conditions under which the most powerful wind waves develop. The swell generated here must be regarded as the main wave on which higher-order waves are superposed; the latter have a considerably lesser energy. Using a method described earlier by the author it was possible to compute the height and length of the main waves developing at two points: the boundary of the hurricane eye passes through one of them during its translational motion; the other point was selected at a distance of 80 km from the trajectory of the center of the hurricane. The difference in phase velocities of swell on the flanks of the defined zone leads to the appearance of the refraction of swell waves which outdistance the hurricane system during its translational motion: the swell must be deflected to the left of the direction of the translational motion of the hurricane in the northern hemisphere (in the southern hemisphere -- to the right). The theory is confirmed by observations in the ocean. New formulas have been proposed for computing wave attenuation under the influence of internal turbulent friction. It is demonstrated that the height of swell running a distance of 600 km in the field of a tropical hurricane should decrease by approximately 13%.

[177]

MESOSCALE TURBULENCE IN UPPER TROPOSPHERE

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian
Vol 13, No 11, 1977 pp 1175-1184

[Article by N. Z. Pinus, Central Aerological Observatory, "Experimental Investigations of Mesoscale Turbulence in the Upper Troposphere"]

[Abstract] On the basis of the results of special aircraft measurements of longitudinal and transverse fluctuations of wind velocity in the upper troposphere during flights at different angles to the direction of the mean wind the author cites estimates of the relative gustiness of the wind velocity components, fluctuations of wind direction, anisotropy of velocity and integral spatial scale of turbulence, values of horizontal turbulent transfer of momentum for the region of wave numbers $5 \cdot 10^{-4} - 2 \cdot 10^{-5} \text{ m}^{-1}$ and a model is proposed to explain the geometry and evolution of mesoscale disturbances. The standard deviation of wind direction from the direction of the mean wind decreases with an increase in the velocity of the mean wind; with a mean wind velocity of 10 m/sec the standard deviation can attain $\pm 20^\circ$ and with a velocity of 50 m/sec it does not exceed $\pm 4^\circ$. The anisotropy coefficient increases with a decrease in wave number.

[177]

GROWTH OF HAIL PARTICLES IN MEDIUM OF SUPERCOOLED LARGE DROPLETS

Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 87, No 2, 1977 pp 345-348

[Article by G. A. Nadibaidze and G. A. Robitashvili, Transcaucasian Scientific Research Hydrometeorological Institute, "Growth of Hail Particles in a Medium of Supercooled Large Droplets"]

[Abstract] The authors examine the coagulation growth of hailstones at the expense of supercooled large droplets in the presence of water sources and ice nuclei. It was found that there is a definite limiting initial concentration $N_2(0)$, below which all the ice particles grow above the size V_{dang} , whereas above $N_2(V_{\text{dang}})$ they decrease. [V_{dang} is the volume of a hailstone of a dangerous size.] Depending on the relationship of velocities of entry of liquid and ice particles the number of hailstones of "dangerous" sizes $N_2(V_{\text{dang}})$ can increase or decrease. When the source of droplets is taken into account the $N_2(0)$ value increases. Allowance for the source of ice particles leads to the opposite effect. With the simultaneous introduction of some quantity of ice particles and their uniform introduction in this same total quantity the concentration of hailstones of "dangerous" sizes is considerably less in the first case. The spectrum of ice particles during growth in a large-droplet medium becomes two-modal.

[169]

III. OCEANOGRAPHY

Abstracts of Scientific Articles

GRAVITY ANOMALIES AND TOPOGRAPHY OF MID-ATLANTIC RIDGE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 237, No 4, 1977 pp 812-816

[Article by Corresponding Member USSR Academy of Sciences Yu. D. Bulanzhe,
M. G. Kogan and Ye. I. Magnitskaya, Institute of Physics of the Earth,
"Long-Wave Gravity Anomalies and Topography of the Mid-Atlantic Ridge"]

[Abstract] This investigation is based on a survey made by the Institute of Physics of the Earth along the Mid-Atlantic Ridge from 70°N to 35°S. An effort was made to determine the relationship between the measured free-air gravity anomalies and the theoretical gravitational effect in the McKenzie-Slater model. Figure 1 in the text shows a profile of free-air gravity anomalies and topography across the Mid-Atlantic Ridge. Figure 2 is a map of free-air anomalies and anomalous topography for the region of the Mid-Atlantic Ridge. In earlier investigations there was found to be a stable correlation between long-wave gravity anomalies and topography anomalies in a limited sector of the Atlantic (30-50°N). Now the correlations have been determined along the entire ridge. The areal analysis in the North Atlantic was based on 7,975 measurements. The compiled map is based on mean anomalies for grid squares measuring 5° x 5°; 623 measurements in the South Atlantic were used in computing the means for grid squares measuring 1° x 1°. It was found that the zone of stable correlation occupies the sector of the Atlantic 10-50°N. The correlation of the gravity field and anomalous topography disappears to the north of 50°N. It was found that in the regional gravity anomalies over the Mid-Atlantic Ridge the role of lithospheric sources is relatively small and the long-wave background, not correlating with ridge topography, dominates. It therefore follows that the spatial inhomogeneities and the corresponding motion of matter in the lower mantle are not directly related to the position of the mid-oceanic ridge. This result gives basis for refuting the model of global convection in the mantle proposed by McKenzie.

[183]

IV. TERRESTRIAL GEOPHYSICS

Abstracts of Scientific Articles

CONTINENTAL DRIFT AND MOTION OF POLES

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 11, 1977
pp 22-40

[Article by V. P. Keondzhyan and A. S. Monin, Institute of Oceanology,
"Continental Drift and Large-Scale Movements of the Earth's Pole"]

[Abstract] The authors discuss the possibilities of considerable motions of the pole of the earth's rotation in the geological past. The article proposes a dynamic model of polar motion due to redistribution of masses in the continent-ocean system. As the initial information on the movements of paleostable continental blocks during the period of the Phanerozoic use is made of the paleogeographic maps compiled by Zonenshain and Goroditskiy. It was possible to compute a family of the absolute trajectories of the pole, each of which corresponds to a definite value of the parameter which is a combination of the effective viscosity of the mantle and the adopted law of radial distribution of density beneath the continents and the oceans. Using the variation principle, related to the principle of a minimum effect, an unambiguous choice is made of the absolute trajectory of the pole. The trajectory has the form of a loop, extending along the meridian 180° approximately 90° . The effective viscosity of the mantle corresponding to this trajectory in the case of a model density distribution is of the order of $6 \cdot 10^{23}$ poise and makes it possible to postulate a well-developed cellular process in the mantle. The formulated law of motion of the pole and the computed absolute movements of the continental blocks in this case correspond well to the model of variations in convection regimes in the earth's mantle with a Phanerozoic sequence: two-cell - one-cell - one-cell regime.

[173]

THEORETICAL DETERMINATION OF STRESSES-STRAINS IN SEISMIC REGIONS

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 11, 1977
pp 54-67

[Article by L. V. Nikitin and S. L. Yunga, Institute of Physics of the Earth,
"Methods for Theoretical Determination of Tectonic Strains and Stresses in
Seismically Active Regions"]

[Abstract] A study was made of the process of deformation and stressed state of a seismically active region in which there is slippage along faults in earthquake foci regions. An expression is derived for the rate of the seismotectonic deformation. For the computations it is necessary to have information on the mechanisms and seismic moments of the earthquakes. As an example the article gives computations of seismic deformation of the Kurile-Kamchatka zone. A comparison of the tectonic stressed state with earthquake mechanisms is made on the basis of the assumption of a coincidence of the direction of the displacement at the focus and the direction of the shearing stress vector at a discontinuity not corresponding, generally speaking, with the plane of action of the maximum shearing stress. The authors formulate the inverse problem of determining, on the basis of earthquake mechanisms, the orientation of the principal axes and the relationships between the principal values of the tensor of tectonic stress and the choice in each earthquake mechanism of the true discontinuity. An algorithm for solution of this problem was formulated and this is illustrated in model examples.

[173]

VERTICAL SEISMOTECTONIC MOVEMENTS IN BAYKAL ZONE

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 11, 1977
pp 41-53

[Article by Yu. V. Riznichenko, V. M. Kochetkov, L. A. Misharina and N. A. Gileva, Institute of Physics of the Earth and Institute of the Earth's Crust, Siberian Department USSR Academy of Sciences, "Vertical Seismotectonic Movements in the Baykal Rift Zone"]

[Abstract] In this paper, for the first time for the zone of the Baykal rift, specialists have computed not only the direction of the principal axes of the registered stresses and strains at the earthquake foci, but also the rates of seismic flow of rock masses. This has been done for the time being only for the vertical component. For this purpose use has been made of data on the parameters of the long-term mean seismic regime, in particular, on seismic activity and on the directions of the axes of dilation and compression of the focal mechanism. In the rift zone there are

descending seismic currents with rates up to 2 mm/year. This is only an order of magnitude less than the total mean rates of recent tectonic movements in the most active regions of the earth. The next task in continuing these seismotectonic investigations in the Baykal rift zone is computations of the horizontal components of the seismic flow and in general all the components of the tensor of deformation rates for this current in this particular region. It is also necessary to carry out a quantitative comparison of the indices of seismic flow and the functions of geological-geophysical fields and with the indices of neotectonic and recent movements. Figure 2 in the text is a large map of seismic activity in the Baykal zone for the period 1968-1974; Figure 4 is a map of the rates of vertical seismotectonic movements.

[173]

REVIEW OF NEW DIRECTIONS IN SEISMIC RESEARCH

Novosibirsk GEOLOGIYA I GEOFIZIKA in Russian No 11, 1977 pp 47-53

[Article by N. N. Puzyrev, Institute of Geology and Geophysics, "New Directions in the Development of Seismic Research Methods"]

[Abstract] This review presents the principal results of investigations in new directions in the seismic prospecting method carried out by the specialists of the Institute of Geology and Geophysics Siberian Department USSR Academy of Sciences in collaboration with other organizations. Also presented are some results and prospects for the development of the transverse waves method, the use of diffracted waves, the frequency method of vibrational seismic prospecting and regional seismic investigations in inaccessible regions of Siberia. The author emphasizes the need for intensifying fundamental investigations for the development of the seismic method on the basis of combined use of waves of different types and also creation of more modern samples of seismic apparatus and equipment.

[168]

FACTORS INFLUENCING SHAPE OF ENVELOPE OF CODA WAVES

Tashkent UZBEKSKIY GEOLOGICHESKIY ZHURNAL in Russian No 4, 1977 pp 64-69

[Article by M. S. Zakirov and V. I. Khalturin, Seismology Institute Uzbek Academy of Sciences and Institute of Physics of the Earth, "Influence of the Focal Region and Observation Region on Shape of the Envelope of Coda Waves"]

[Abstract] The tail part of the seismogram, the coda wave, is attracting increasing attention as a source of information on structure of the medium and focal properties. The most important properties of the coda wave are

a constancy of the shape of the envelope for all the earthquakes in a definite region and a coincidence of the coda level for the same earthquake at different stations independently of epicentral distance. A study was made of more than 300 records of the envelopes of 62 earthquakes with a magnitude from 3.5 to 7.2 with an epicentral distance from 70 to 1,000 km. The study revealed the following properties of the coda waves, confirming the data obtained by other researchers: a) the time when the envelope reaches a stable asymptote is equal to 3-5 times the travel time of the longitudinal wave, the first figure being applicable for distances greater than 100-150 km and the second is applicable for lesser distances; b) the level and shape of the coda coincide well for the three components of one station; c) the shape of the coda envelope is not dependent on epicentral distance; d) the coda envelope for one earthquake at different stations (especially within the limits of one observation region) is close, but only after introduction of a station correction; e) the envelope of different earthquakes within one region virtually does not differ in shape, but with an increase in magnitude the coda level increases reliably; f) the level and shape of the coda wave envelope are somewhat dependent on the frequency characteristic of the envelope, and especially on the position of the low-frequency cutoff.

[167]

V. UPPER ATMOSPHERE AND SPACE RESEARCH

News

VISUAL OBSERVATIONS OF EARTH'S SURFACE FROM "SALYUT-6"

Moscow PRAVDA in Russian 22 Dec 77 p 1

[TASS Report: "'Salyut-6': Work Continues"]

[Text] Flight Control Center. The crew of the orbital scientific station "Salyut-6" continues to carry out the planned flight program.

Today the working day for Yuriy Romanenko and Georgiy Grechko began at 0900 hours. The cosmonauts began to conduct experiments to study the earth's natural resources and the surrounding environment in the interests of science and various branches of the national economy. The crew is conducting visual observations of the earth's surface and its oceans. Observations of glaciers, the snow cover in various areas of the earth and the surfaces of oceans and seas will be made.

Also included in the crew's flight program are observations of natural phenomena in various areas of the earth. In particular, the cosmonauts repeatedly saw forest fires on the continent of Africa.

According to telemetry information and reports from the crew, the cosmonauts are in good health. The station's on-board systems are functioning normally. The working day in orbit will end at midnight today. [5]

"SALYUT-6" CREW UNDERGOES MEDICAL EXPERIMENTS

Moscow PRAVDA in Russian 3 Jan 78 p 1

[TASS Report: "'Salyut-6': Flight According to the Program"]

[Text] Flight Control Center. Cosmonauts Yuriy Romanenko and Georgiy Grechko continue to work on the orbital scientific station "Salyut-6."

Today the crew is undergoing medical experiments. The cosmonauts will conduct studies of their cardiovascular systems using the "Chibis" vacuum suit. Also planned are comprehensive studies of the cosmonauts' circulatory systems and a number of other experiments.

According to medical monitoring data, both members of the crew are in good health. The pulse rate of the commander is 65; the flight engineer -- 60. Their blood pressures are 130/65 and 120/60 respectively.

According to reports from the crew and telemetry information, the station's on-board systems are functioning normally. The flight of the orbital scientific station "Salyut-6" continues. [5]

BIOLOGICAL AND TECHNICAL EXPERIMENTS ON "SALYUT-6" CONTINUE

Moscow PRAVDA in Russian 5 Jan 78 p 1

[TASS Report: "'Salyut-6': Experiments Continue"]

[Text] Flight Control Center. Cosmonauts Yuriy Romanenko and Georgiy Grechko are continuing to work on the manned scientific station "Salyut-6."

In accordance with the program of biological research an experiment to study the development of amphibians under the effects of spaceflight has been completed. The biological subjects have been preserved. Consequently they will be sent to earth for analysis under laboratory conditions. Experiments to study the development of chlorella and of several species of insects under the conditions of prolonged exposure to weightlessness are continuing.

In accordance with the program of technical experiments yesterday yet another cycle of studies on the dynamics of the station's structural components was conducted.

Today the crew's working day began, as usual, at 0800 hours. At this time the station had completed its flight outside of the zone of radio contact with Soviet territory. Since breakfast and a medical checkup the cosmonauts have been working in accordance with the projected flight program.

Romanenko and Grechko are in good health. The flight of the "Salyut-6" station continues. [5]

MEDICAL, ASTRONOMICAL EXPERIMENTATION ON "SALYUT-6"

Moscow PRAVDA in Russian 10 Jan 78 p 1

[TASS Report: "'Salyut-6': Flight According to Program"]

[Text] Flight Control Center. Cosmonauts Yuriy Romanenko and Georgiy Grechko are continuing scientific and technical experiments on the manned orbital station "Salyut-6." This past Sunday was a day of medical experimentation for the crew. The cosmonauts carried out the routine cycle of complex studies of the circulatory system. Also conducted were a clinical study and electrocardiograph of both members of the team at rest and after physical stress on the veloergometer.

During the second half of the day, while the station was on the night side of the earth, the cosmonauts observed the solar corona and the zodiacal light. This experiment was conducted in order to study the structure of the dust and electron component of the solar corona at great distances from the sun.

Technical experiments to study and test promising devices for astroorientation and space navigation have been planned for today's flight program. The experiments are being conducted when the station is on the day and night sides of the earth. The cosmonauts are also analyzing the methodology of operations with these devices.

According to medical monitoring data and reports from the crew, the cosmonauts are in good health. The commander's pulse rate is 65; the flight engineer's is 60. Their blood pressure is 125/60 and 120/60 respectively.

The flight of the "Salyut-6" station is continuing. [5]

TASS ANNOUNCES LAUNCHING OF "SOYUZ-27"

Moscow PRAVDA in Russian 11 Jan 78 p 1

[TASS Report: "'Soyuz-27' in Flight"]

[Text] In accordance with the space research program, the "Soyuz-27" spacecraft was launched in the Soviet Union on 10 January 1978 at 1526 hours Moscow time. It is piloted by flight commander Lieutenant Colonel Vladimir Aleksandrovich Dzhanibekov and flight engineer Hero of the Soviet Union and pilot-cosmonaut Oleg Grigor'yevich Makarov.

The flight program for the "Soyuz-27" envisages a docking with the "Salyut-6" orbital station and joint research and experimentation on board by the crews of the two spacecraft.

The "Soyuz-27" on-board systems are functioning normally; the cosmonauts are in good health.

Cosmonauts V. A. Dzhanibekov and O. G. Makarov have begun to execute the flight program. [5]

COSMONAUTS OBSERVE NOCTILUCENT CLOUDS AND DUST STORMS

Moscow PRAVDA in Russian 6 Jan 78 p 6

[Article by V. Gubarev: "I See a Storm..."]

[Excerpts] "During the past flight I never saw anything like it," transmits Georgiy Grechko. "Over the south pole there were two, no, three layers of noctilucent clouds. It would be good if all the on-board instrumentation could pass through it..."

"We will discuss your proposal," responds the Center.

"We see icebergs," says Yuriy Romanenko. "They are pure and white..."

The inhabitants of the "Salyut-6" love to look out the windows of their space home. If they have a free minute (if, to be sure, visual observations are not provided for in the program on this particular day) they float up to the window and report to the earth what is occurring on the planet. In Africa and Australia it is summer and there are many forest fires; the northern hemisphere is almost completely covered with clouds -- it is winter there. The ocean is calm in the "Roaring Forties" and in the Kamchatkan area there are storms brewing up... This is just a little bit of what the cosmonauts see in the 1 1/2 hours which are required for each journey around the earth!

"Today we are becoming familiar with still another profession of our cosmonauts," says Candidate of Geographical Sciences Igor' Konstantinovich Abrosimov. "In accordance with the instructions of the State Center "Nature" ["Priroda"], Yuriy Romanenko and Georgiy Grechko have again become 'requalified.' Now they have become geographers. However, the representatives of our profession, one of the oldest in science, can only envy them: in a few minutes they cross all geographic zones and pass through all the seasons of the year. They 'take in' such regions where it takes land travellers weeks to reach. In accordance with our instructions, Romanenko and Grechko are investigating ocean currents, are tracing the change in vegetation zones, and are studying the shallow waters on the shelf, which are frequently called the 'storehouses' of the ocean. There one can find fish, petroleum and minerals... And, naturally, the 'Salyut-6' crew is recording different weather calamities and other phenomena, such as hurricanes, fires and dust storms."

"The boundaries of the desert can be seen clearly," we hear from space, "but from time to time one can observe 'spots,' which is probably dust rising..."

Probably the cosmonauts will soon solve the debate among geographers as to whether the deserts are advancing. It has been postulated that the Sahara is gradually creeping to the south. Comparison of data from space obtained on earlier flights and on the present flight will help scientists to answer this and similar questions.

[175]

SPACESUIT REDESIGNED FOR "SALYUT-6" MISSION

Moscow IZVESTIYA in Russian 22 Dec 77 p 5

[Article by B. Konovalov: "The Cosmonaut's Armor"]

[Text] The night of 20 December was so stressed that after emergence into open space and a report on the work done there the cosmonauts fell into a deep sleep. The Control Center, to be sure, foresaw that the crew would be fatigued and for 20 December planned a day of rest. The cosmonauts, regardless of any program, could admire the earth, discuss the exciting events of the past day.

Georgiy Grechko emerged into open space in a new spacesuit of the semirigid type, created by Soviet specialists.

The spacesuit is unusual. Its body and helmet are made in the form of metallic plates, like for the knights of old, whereas the sleeves and trousers are soft. Aboard the station these spacesuits were placed in special recesses. The back of the metal "armor" is opened and the cosmonaut gets into the spacesuit. One movement of the arm and the "back" is reliably clamped and becomes airtight. The back of the "armor" serves not only as a hatch, but also as a backpack for the self-contained life support system which supplies the cosmonaut with oxygen, absorbs carbon dioxide, maintains a high pressure level and ensures that the heat excess will be carried off from the body. The electric current is fed through the safety line from the side of the orbital station.

The metal body of the spacesuit can fit a cosmonaut of any stature. Lacing on the sleeves and trousers can make them shorter or longer. The helmet with a light filter, making it possible to work under the blinding bright rays of the sun, also is rather ample. Individual removable gloves, made specially for the hand, make it possible to perform quite precise operations. Soviet cosmonauts now have at their disposal not a spacesuit for individual use, but in essence a standardized "sealed cabin" which is made in the form of human garb. One of the creators of the spacesuit told the journalists that this was in essence a machine and far more complex than the "Zhiguli" auto, which is known to all.

An important peculiarity of the spacesuit is the use of an effective method of water cooling of the cosmonaut's body during work. They don a "lacy" bound overalls into which flexible plastic tubelets are incorporated. The water flows through these "veins" and cools the cosmonaut. He himself can regulate the thermal regime in the spacesuit, making it warmer or cooler. To use the picturesque language of one of the designers, in such a spacesuit it is possible to chop wood without getting overheated.

In order to ensure mobility in the places of joining of the metallic body and the soft "arms" and "legs" there are unusual "joints" -- special bearings.

The surface of the semirigid spacesuit is sheathed with a multilayer "shell" with screening-vacuum insulation and then a light-colored synthetic material. A sort of "thermos" is created around the cosmonaut. And the self-contained life-support system creates an excellent microclimate within the spacesuit.

"I tried out the semirigid spacesuit," Aleksey Leonov told me at the Control Center. "It is far more comfortable than the soft one in which I emerged into open space. It can be donned in a few minutes and without the assistance of a comrade. The absence of external lines connecting the life support system with the spacesuit increases its reliability. It is convenient to work in it and conditions are pleasant. One can work in it an entire work shift, rather than tens of minutes, as before. After servicing and replacement of expendable elements the spacesuit can be reused. Such multiple use makes the new spacesuit convenient for regular inspections of the state of the instruments on orbital stations and the scientific instrumentation present in open space. Using the suit it is possible to carry out repair and assembly work in space and this suit has a good future."

[153]

NEWLY DESIGNED SPACESUIT DESCRIBED

Moscow PRAVDA in Russian 21 Dec 77 pp 1, 6

[Article by A. Pokrovskiy: "The Hatch is Opened to the Universe"]

[Excerpt] At 0036 hours on 20 December Yuriy Romanenko and Georgiy Grechko opened the hatch into the universe. They opened it at a distance of more than 330 km from the earth, under conditions of a space vacuum, ultralow temperatures, solar radiation and weightlessness, to carry out a prophylactic examination and checking of the state of the external elements of the station in the region of the transfer compartment and the "Salyut-6" docking unit situated on it.

A suit for emergence into open space should have reliability equal to the reliability of the sealed compartments of the ship and convenience during working operations. It is not easy to combine these two requirements.

Yu. Romanenko and G. Grechko reported from orbit that the designers had dealt well with these problems:

"The pressure in our spacesuits is good and we also feel well."

The story about the space dress of the "Taymyrs" merits special attention also because it is the last word in spacesuit construction. The experience accumulated as a result of work aboard the "Voskhod-2" when A. Leonov emerged into open space and when A. Yeliseyev and Ye. Khrunov passed through open space from the "Soyuz-5" to the "Soyuz-4," has enabled our specialists to create a model of a spacesuit of a fundamentally new design, of a so-called semirigid type. This is somewhat like metal armor, constituting an integrated whole with the helmet, but the sleeves and sheathing for the legs are soft. The spacesuit need not be stretched, and it is not really "put on." It is entered through a hatch on the "back."

This can be done by one cosmonaut without assistance from a comrade. Then using a special thin line he closes the cover of the hatch; he presses a hand lever and the spacesuit is made airtight. For a trained man this takes only two or three minutes. As a result, he is closed in an unusual multilayer thermos and is reliably protected against the influence of space and the necessary microclimate is created.

The entire life support system is placed for the most part in the cover of the hatch, constructed in the form of a backpack. And then there is still another advantage of a spacesuit of the semirigid type -- there are no external communication lines running from the backpack to the other parts of the clothing. This is of more than a little importance for work in open space.

In general, however, the compact spacesuit with respect to its complexity and the number of units and parts is the equal of the "Zhiguli" auto. At the same time it is reliable and convenient; while wearing it a man can work an entire work shift, performing work equal in its intensity to the work of woodchoppers on the earth. While doing so the cosmonaut does not even perspire. A water-cooling system incorporated in a special suit makes it possible to change the heat regulation for different physical loads.

The cosmonauts could not simultaneously carry out an external inspection of the station and work with the television camera. Therefore, it was possible to judge about all which was taking place only on the basis of their reports to the earth and individual remarks. But the directors at the Cosmonaut Training Center had with foresight carried out "ground training" of the journalists so that we could rather clearly visualize everything which was happening.

The fact is that at Zvezdnyy Gorodok there is a "hydrospace," that is, simply a basin with working models of the docking "Salyut" and "Soyuz." The testers put on a spacesuit, adjust it in such a way as to acquire zero buoyancy, and head for the "hydrospace." A videorecord preserved the course of training

of the "Taymyrs" during the entire program of work in space. And now radio-communication confirms that everything is going the way that was provided for on earth.

The ship's engineer G. Grechko must successively inspect the surface of the station in the region of the transfer compartment and elements of the docking unit. He must evaluate the state of the electric connections, sensors, guide pins of the pushrods, locks and contact surfaces of the unit. After all, it is not impossible that they could be impaired as a result of deviation from the regime of docking to the unit of the "Soyuz-25" ship.

Whatever seems ordinary and easy on earth is considerably complicated in space. The hatch is not very ample and it is quite difficult to creep through it under weightlessness conditions. But now the commander Yu. Romanenko has come to the assistance of the ship's engineer. And now, layer by layer, they are checking the state of the vacuum-screen covering of the station and the docking unit. And finally, the report of "Taymyr-2":

"A threefold inspection has revealed that the end of the transfer compartment and other elements of the station -- antennas, batteries (cells), outside lights -- are in complete order."

Now comes the final stage of emergence into space -- work with the television camera. It already begins while in the earth's shadow.

"I see the moon, stars and flashes of lightning," says Georgiy Mikhaylovich. "And our planet looks beautiful from here, like from a high cathedral."

"You have an auditorium which can only be envied," responds "Zarya."

"A red band has broken over the horizon. The dawn is beginning. Where are we now?"

"You are over Siberia," reports the earth.

In the light of the breaking space day Grechko first transmits the image of individual parts of the station and then directs the television camera onto our planet. The clearly visible disk of the earth in the blue aureole of the atmosphere, with the green forests lying below, floats beneath the wing of solar cells on the "Salyut-6."

The hatch of the "Salyut-6" was open for 88 minutes. During this time the crew had carried out a great amount of work. We recall the words of S. P. Korolev: "Emergence into space, the same as the first flight into space, is an element of discovery." And pioneers are always followed by others.

[145]

NOCTILUCENT CLOUDS STUDIED FROM "SALYUT-6"

Moscow PRAVDA in Russian 7 Jan 78 p 1

[TASS Report: "'Salyut-6': Flight Continues"]

[Text] Flight Control Center. The flight of cosmonauts Yuriy Romanenko and Georgiy Grechko on the manned scientific station "Salyut-6" is continuing.

Yesterday, in carrying out the program of research and experimentation, the crew observed and photographed a rare physical phenomenon in the earth's upper atmosphere -- noctilucent clouds. The study of their nature is of great scientific interest. The cosmonauts also completed the preparation and testing of a special shower unit. The shower unit is an enclosed elastic cylindrical cabin. It includes a system for the heating, supply, collection and purification of water.

Today the crew is conducting a medical checkup, doing physical exercise and taking a shower. During communications sessions the cosmonauts reported to earth that the space shower functions excellently.

According to telemetry information and reports from orbit, Romanenko and Grechko are in good health. The station's on board systems are functioning normally. The orbital flight of the "Salyut-6" station is continuing.
[5]

TASS ANNOUNCES LAUNCHING OF "KOSMOS-974"

Moscow PRAVDA in Russian 8 Jan 78 p 2

[TASS Report: "'Kosmos-974'"]

[Abstract] The artificial earth satellite "Kosmos-974" was launched in the Soviet Union on 6 January 1978. The satellite was inserted into an orbit with the following parameters:
-- initial period, 89.6 minutes;
-- apogee, 356 kilometers;
-- perigee, 188 kilometers;
-- orbital inclination, 62.8 degrees.

ROMANENKO AND GRECHKO IN FLIGHT FOUR WEEKS

Moscow PRAVDA in Russian 8 Jan 78 p 1

[TASS Report: "'Salyut-6': Experiments in Orbit"]

[Text] Flight Control Center. The fourth week in the flight of cosmonauts Yuriy Romanenko and Georgiy Grechko on board the orbital scientific station "Salyut-6" has ended.

During this period the crew of the orbital station conducted many scientific, technical and biomedical experiments and studies. During the flights the cosmonauts made a number of prophylactic inspections, serviced the station's systems and assemblies and walked in outer space.

Regular medical observations and comprehensive examinations conducted once a week have shown that the process of adaptation to weightlessness proceeded normally for the cosmonauts. Any medical data received is of great significance for a deeper understanding of the effects of spaceflight on the human organism.

Today the crew has a day of active rest. The cosmonauts are conducting a prophylactic inspection of the scientific equipment, doing physical exercises and resting.

According to telemetry information and reports from the crew, Yuriy Romanenko and Georgiy Grechko are in good health.

The station's on-board systems are functioning normally. The flight program is being executed successfully. The flight of the orbital station "Salyut-6" is continuing. [5]

"SALYUT-6" BIOLOGICAL EXPERIMENTS DESCRIBED

Moscow IZVESTIYA in Russian 7 Jan 78 p 2

[Article by B. Konovalov: "Journey to the Unknown"]

[Excerpt] Recently a mysterious communication was received from aboard the "Salyut-6." Flies are flying in the work compartment. At first everyone decided that these were "tourists" which had accidentally gotten on board. But soon it was clarified that these were entirely legitimate "passengers": Drosophila with an extremely solid scientific pedigree. This fly became popular with geneticists because it rather rapidly passes through its full life cycle: larva, pupa and adult, which lays eggs carrying within them the next generation. All this takes 12 to 15 days and in the new generation the researcher can see the influence exerted by the conditions under which the parents lived. This has made Drosophila the test object for space geneticists. Before launching they were placed aboard the "Soyuz-26" in the special "Biotherm" instrument and then were carried aboard the "Salyut-6." The experiment went off extremely successfully. A mass of larvae formed from the eggs already laid on earth. The larvae, possibly in search

for fresh air, jammed the air lines in the instrument. There they pupated and after 12 days made their way out beyond the limits of the space allocated them within the instrument.

The cosmonauts saw with their own eyes that the flies had passed through the full stage of development. Now the biologists are interested in whether there will be a second generation. The fact is that on the "Salyut-4" a similar experiment was carried out and it was found that in space the Drosophila lay sterile eggs -- no new generation appears. Now it will be possible to check whether this is an isolated fact or whether it is a pattern.

A still more fertile representative of the living world of our planet is the microalga Chlorella. A month of flight for it represents tens of generations. Chlorella is an extremely nutritious product. It has been proposed that it be used in biological life support systems which in the future will supply the cosmonauts with oxygen, water and food. It is important to trace those changes which occur in the cells of Chlorella from generation to generation. Aboard the "Salyut-6" Chlorella is in a special instrument which makes it possible to activate the vital functions of cells using stimulators and to fix them at any required moment in time. The cosmonauts will deliver to scientists, speaking figuratively, "frozen" samples of cells of different ages "from the great-great grandparents to the great-great grandchildren." And already in terrestrial laboratories they will be subjected to thorough analysis with the most modern instrumentation.

Aboard the "Salyut-6" there are also inhabitants of terrestrial ponds, which are neighbors of Chlorella -- small frogs. Before the launching of the "Soyuz-26" fertilized frog eggs were placed in containers. After transfer to the station the cosmonauts placed these eggs in a thermostat alongside young frogs which had been born on earth and now the cosmonauts can compare how the "terrestrial" tadpoles and those hatched in space behave. The scientists will then make a detailed study of them, in particular, the organs of orientation. But for the time being it can be seen with the naked eye that the "space" tadpoles are moving in spirals.

For the first time aboard the "Salyut-6" a biological experiment has been carried out which is related not only to the problem of the existence of life in space, but also to its sources. In this experiment, called "Meduza," on the outside of the station on the transfer compartment in special flasks there are biopolymers -- the "building blocks" from which any living organism is created. Some of the flasks are open to the entire shower of solar and cosmic radiations and some are placed securely within the station. A comparison of these samples of biopolymers will make it possible to establish what influence is exerted by the broad spectrum of cosmic radiations which it is virtually impossible to reproduce at once under laboratory conditions on the earth.

[181]

"DEL'TA" NAVIGATION SYSTEM DESCRIBED

Moscow IZVESTIYA in Russian 27 Dec 77 p 2

[Article by B. Konovalov: "Space Robot 'Del'ta'"]

[Excerpt] Saturday Romanenko and Grechko devoted to a detailed checking of the "Del'ta" system. "Delta" is a letter of the Greek alphabet popular among mathematicians and has been assigned to the autonomous on-board navigation system. This is a singular space robot which aboard the "Salyut-6" now in essence plays the role of navigator of the expedition.

To be sure, outwardly the "Del'ta" definitely does not resemble any of those humanlike robots described on the pages of scientific novels and tales. In one of the rooms at the Flight Control Center assigned to the "Autonomous Navigation Group" the journalists were shown a terrestrial twin of the space robot. Due to the use of the most modern electronics systems the "Del'ta" looks rather compact. The "brain" of the robot is an on-board computer the size of a small, fashionable suitcase. Separately placed are the portable, but high-capacity memory systems, the "organs of sense" -- the radioaltimeter, speed indicator, astronavigation sensors. The control panel is designed in the general style of the panels which are situated at the central control post of the "Salyut-6." Aboard the station it is situated to the right of the ship's engineer's seat. All the instructions on how the cosmonaut is to deal with the "Del'ta" (for ordinary instruments they are recorded in the ship's log) are stored in its memory. With application of pressure to the appropriate keys on the control panel they light up on a small screen resembling a television receiver. If the cosmonaut makes any error in the work the "Del'ta" corrects it and an inscription appears on the screen suggesting that which must be done.

The "Del'ta" brain is connected to sensors and different on-board systems of the station. As a result, the commands of the robot are transmitted to the actuating mechanisms and the station can be automatically controlled. Accordingly, the "Del'ta" is also capable of playing the role of an automatic pilot.

The "Del'ta" also "speaks" by means of the "Stroka" on-board teletype, to which it can be connected, and communications are printed out for the cosmonauts on a tape. The morning usually begins with this and as a result of the "Del'ta" the conditions for the entire working day are immediately clear.

The space robot itself, without intervention of the Control Center, determines the station's orbit and predicts its motion. Usually this time-consuming work is performed only by ground systems of the command-measurement complex. For this purpose there are a great many ground measurement stations distributed over the territory of our country. Ocean-going ships

of the space fleet, tracking the motion of the orbital station, transmit trajectory measurement data to the coordination-computation center. There, high-capacity computers, created on the basis of the "BESM-6," process information, determine the orbit and supply a complex of ballistic data necessary for computing operations for flight control. Some of these data the Control Center operator transmits to the cosmonauts aboard their ship. The cosmonauts record these data and in turn repeat them so that the earth will be able to check as to whether the information was received correctly.

And now the on-board robot "Del'ta" is challenging this unwieldy system. By means of the "Del'ta" radioaltimeter at definite intervals it is possible to determine the altitude of the station above the earth's surface. The Doppler instrument for measuring the radial velocity at the time of transit over radio beacons situated in the territory of our country determines the velocity of motion of the station. The astrosensors situated on the outside of the station register the rising and setting of the sun and other celestial bodies. This is a sort of automatic "sextant" -- an analogue of that which is used by seamen.

Receiving this "food for thought," the on-board computer computes the orbital elements, inclination, greater semiaxis, time of transit through perigee, etc., and then station motion is predicted.

In the morning after interrogation of the cosmonauts the following appears on the teletype tape: "Printout from 'Del'ta'." And the schedule for the coming day appears: onset of each revolution - time of transit across the equator, beginning and end of radio communication contacts, time of entry and emergence from the shadow, longitude at the equator on each revolution. In addition, at any moment the "Del'ta" can operate in a so-called servicing regime. At the request of the cosmonauts the robot reports the onset of the next communications session or the time of emergence from the shadow. Using a line with a button attached the cosmonaut when working with any instrument, like with a stop watch, can register precise Moscow time at the necessary moment. The cosmonaut not only sees this lit up on the panels of the control panel, but it will be printed on the "Stroka" teletype tape. This is very convenient when processing observations of various phenomena and their tie-in to the position of the orbital station.

But this does not exhaust the merits of the cosmic robot. It now also performs the task of an on-board communications specialist. Strictly in accordance with the orbital parameters stored in the memory of the on-board computer, a minute before entry into the zone of radiovisibility of ground stations the "Del'ta" automatically switches on the on-board radio systems, warms them up, and a minute after emergence from the zone switches the systems off. Earlier this was done from the earth through a command radio link, during the time of a communications contact. So the robot now economizes the resources of the command radio link system and the time of communications contacts.

The "Del'ta" dates its pedigree from the first "Soyuz" ships; its individual elements were tested on these first ships. The first semiautomatic model appeared on the first of the series of the "Salyut" orbital stations. It has been improved from station to station. And now on the "Salyut-6" the space robot has passed through the experimental period of its life. Since 20 December 1977 the "Del'ta" has been operating as a standard system on board the "Salyut-6." The detailed checking, carried out on Saturday, once again has shown that the robot has proven its value.

[150]

COMMENTS ON "SALYUT-6" MONTH IN ORBIT

Moscow PRAVDA in Russian 10 Jan 78 p 3

[Article by V. Gubarev: "'Salyut-6': Month of Flight"]

[Excerpt] "The mood of Yu. Romanenko and G. Grechko is very good," says the Flight Director Twice Hero of the Soviet Union A. S. Yeliseyev. "The 'group psychological support of the crew' has been worked out well; this was created for the present flight. The 'Ogonek' space new year's issue, meetings with relatives and scientists, musical accompaniment of communication sessions, organization of active rest of cosmonauts, all this unquestionably will assist Yuriy and Georgiy to maintain an excellent mood. Medical monitoring is being carried out constantly and confirms the high performance of the crew."

"The course of the flight is covered extensively in the press and television," says Aleksey Stanislavovich. "I will say one thing: we are proceeding precisely in accordance with the program. True, there have been some deviations, but then the crew got back on schedule. For example, we had a problem with water: where was it disappearing? It was found that the regeneration system was feeding out less water than it should. Was it being condensed? But this was impossible -- our ship was 'warm.' The cosmonauts made an inspection of the station and no water droplets were found. A real puzzler! Finally, an explanation was found. The station was prepared for launching in summer; some decorative parts had become overdry and precisely they collected moisture during the flight. Now the water balance is normal... We carried out many interesting tests during this month. Suffice it to mention that there are several hundred instruments aboard. Virtually all of them have been checked. This is possibly not very effective work, but it is completely necessary. A great volume of scientific and technical tests: this is the real result of the month of flight of Yuriy Romanenko and Georgiy Grechko. I want to mention the superb preparation of the crew: if any observation is made, it is done thoroughly and very carefully..."

More and more specialists are appearing at the Control Center. Some have been invited by the cosmonauts. The other day Candidate of Physical and Mathematical Sciences Ch. Y. Vilman arrived from Tartu. At the request of

the Institute of Astrophysics and Physics of the Atmosphere Academy of Sciences Estonian SSR the crew carried out a survey of noctilucent clouds.

The day before Georgiy Grechko said:

"We need consultation with a specialist. We are reluctant to expose the film..."

And here is the next dialogue between the earth and space.

"Vilman is communicating," reports the Center.

"Good day, Charles Yohannesovich," says Grechko. "This is the problem: the horizon is very light; if we photograph only the clouds, you will probably not be able to make a tie-in... Right?"

"Use two exposures. Two frames -- one with the horizon and the other without it. You have sufficient film... Incidentally, after a week the conditions for a survey will improve."

"We have been observing these clouds for three weeks," says Grechko. "And they are always at the same altitude. Is it necessary to use color film?"

"Absolutely..."

The communications session continues. The ship receives exhaustive information from the Center. But before departure from the zone of radiovisibility the cosmonauts ask a new series of questions. By the next revolution the group of specialists will have the answers ready.

So go the days of flight. Today it is investigation of noctilucent clouds over the south pole. Tomorrow it is biomedical experiments and the testing of new instrumentation. The "Salyut-6" is flying over the planet and the scientific laboratory of the earthlings is in operation...

"All this month the Cosmonaut Training Center is being checked," says Twice Hero of the Soviet Union G. T. Beregovoy. "From flight to flight there is a complicating of the experiments carried out in space. And we 'rehearse' them on earth long before the launching. Tests are carried out in a hydro-basin and at sea, in a flying laboratory and in trainers. Clear work on board involves testing of training methods and testing of their volume and quality. Our Center is now 'in singular flight,' and we are analyzing each stage: after all, the events transpiring aboard the 'Salyut-6' today constitute preparations for future launchings."

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Abstracts of Scientific Articles

MEAN LONG-TERM MINIMUM REFRACTION EFFECTS IN USSR TERRITORY

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY, GEODEZIYA I AEROFOTOS "YEMKA" in Russian No 4, 1977 pp 50-58

[Article by A. V. Merzenin, Moscow Institute of Geodetic, Aerial Mapping and Cartographic Engineers, "Determination of the Mean Long-Term Minimum Refraction Effects for the Territory of the USSR"]

[Abstract] The article describes a method for determining the time when lateral refraction tends to a minimum. The time is computed from the zero values of the hourly sums of the radiation balance, which is represented in the form of a triple Fourier series in variables φ (latitude), d (date), t (time). The authors have computed the coefficients of the series, have demonstrated the convergence of the series for the radiation balance, and have compiled tables of the computed time of minimum refraction effects for latitudes $41.5^\circ \leq \varphi \leq 78^\circ$ for the territory of the USSR. Algorithms and programs have been prepared for computing the coefficients of the Fourier series and the time of minimum refraction effects, on the basis of which it is then possible to reduce the measured directions.

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USE OF COHERENT METHODS IN PHOTOGRAVIMETRY

Moscow GEODEZIYA I KARTOGRAFIYA in Russian No 7, 1977 pp 37-42

[Article by O. A. Gerasimova and A. A. Lobanskiy, "Possibility of Using Fourier Spectra in Aerial Photography"]

[Abstract] The authors have examined the possibility of use of coherent methods in photogrammetry. The article points out the desirability of using Fourier spectra for an analysis of the structure of images, both photographic and those obtained in other types of surveys, such as thermal and radar. Also given are the results of an experiment for evaluating the quality of aerial negatives on the basis of measurement of Fourier spectra.
[166]

APPLICATION OF MATHEMATICAL MODELING IN MULTIZONAL PHOTOGRAPHY

Moscow GEODEZIYA I KARTOGRAFIYA in Russian No 9, 1977 pp 29-34

[Article by O. I. Anfuriyev and L. V. Zaletayev, "Application of the Mathematical Modeling Method for Investigating Processes in Multizonal Photography"]

[Abstract] On the basis of derived mathematical expressions relating the spectral coefficient of brightness of a terrain feature and the optical density of its image on a zonal photograph the authors propose a method for selecting the optimum zones of the spectrum for multizonal photography. As the optimality criterion the authors selected the maximum value of the difference in optical densities of the feature and background.

[165]

VARIATIONAL METHOD FOR THEORY OF FIGURE OF EARTH

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY, GEODEZIYA I AEROFOTOS "YEMKA" in Russian No 4, 1977 pp 21-25

[Article by Yu. M. Neyman, Moscow Institute of Geodetic, Aerial Mapping and Cartographic Engineers, "Basis of a Variational Method for the Theory of the Figure of the Earth"]

[Abstract] The variational method for regularization of the Molodenskiy boundary problem proposed by Tikhonov involves the minimizing of the smoothing functional, a highly important part of which is the stabilizer. In this article the author formulates a broad class of possible stabilizers for the problems in physical geodesy, representing an analogue of the class of Tikhonov stabilizers of the q-th order with constant coefficients. The role of the regularization parameter in the problem of determining the optimum order of the stabilizer is emphasized.

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VI. MISCELLANEOUS

News

SCIENTIFIC EXPERIMENTATION AT "VOSTOK" POLAR STATION

Moscow PRAVDA in Russian 2 Jan 78 p 4

[Article by V. Bardin]

[Summary] Late last year a sledge-tractor train reached Vostok station from Mirnyy. Powerful tractors delivered about 400 tons of different kinds of freight necessary for work and life at the station during the coming year. Now the polar specialists at Vostok are awaiting the arrival of a new team, participants in the 23d Soviet Antarctic Expedition.

Life at such a remote station is naturally of interest for studies of man's health and efficiency under particularly complex conditions, including psychological observations. The small group, long isolated from the outside world, carries out a heavy program. This is an ideal place for studying the psychological climate of a small group, their compatibility. The findings will be of interest in the screening of cosmonauts.

Geophysicists are carrying out a broad research program. After all, the station is located at the south geomagnetic pole. Here is an excellent place for observing processes of disturbance of the ionosphere, caused by the solar wind, accompanied by auroras and magnetic storms, with resultant interruption of short-wave radio communication. Drilling work is also being carried out. The objective is to drill through the entire glacier to the bedrock, with taking of samples the entire distance. This is about 4,000 m. The ice extracted from the depths can tell about the climate of past epochs. This will make it possible to predict changes in climate and glaciation in the future.

The area is also attracting the attention of microbiologists. Last summer a microbiological borehole was drilled to a depth of 312 m. The samples are now being analyzed. A year ago scientists were able to recover microorganisms from a depth of about 200 m. This means that their age is about 8,500 years.

Microscopic studies are being made of membrane filters through which water from different horizons in the glacier is passed. It is possible to detect spores of ancient plants, as well as cosmic and volcanic dust which fell on the ice many thousands of years ago. During the past year 20 Soviet polar specialists have wintered at Vostok, accompanied by one American scientist.

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